

**REMARKS**

Specification and Drawings have been amended. Claims 30 – 42, 44, 47, 49 -51 and 54 have been cancelled and claims 43, 45, 46 and 48 have been amended.

The Examiner has objected to applicant's drawings because FIG. 1 illustrates only that which is old. Applicant is submitting with this Amendment Replacement Drawings that includes an amended FIG. 1 with a legend – Prior Art—added to FIG. 1.

The Examiner has objected to applicant's drawings because FIGS. 1 and 7 include block diagrams with individual blocks which are not labeled. Applicant is submitting with this Amendment Replacement Drawings that include amended FIGS. 1 and 7 in which the block diagrams include individual blocks that are labeled.

The Examiner has objected to applicant's drawings because FIG. 8 includes the reference character "186" which is not mentioned in the description. Applicant is submitting with this Amendment Replacement Drawings that includes an amended FIG. 8 in which the reference character "186" has been removed.

The Examiner has objected to applicant's specification because the title of the invention is not descriptive of the claimed invention. Applicant has amended applicant's title of the invention to recite A METHOD OF DERIVING ENGINE CYLINDER MECHANICAL TOP DEAD CENTRE and believes that the amended title is descriptive of the claimed invention.

The Examiner has objected to applicant's specification because the specification fails to set forth the proper section headings as set forth in 37 CFR 1.77(b). Applicant has amended applicant's specification to include the titles REFERENCE TO RELATED APPLICATIONS, BACKGROUND OF THE INVENTION, BRIEF DESCRIPTION OF THE FIGURES, and DESCRIPTION OF THE PREFERRED EMBODIMENT. Applicant believes that the amended specification is in compliance with 37 CFR 1.77(b).

The Examiner has objected to claim 44 because the word "is" in line 3 should be deleted and to claim 47 because the phrase "the mechanical top dead centre" lacks antecedent basis. Claims 44 and 47 have been cancelled thereby obviating the Examiner's objection.

Claims 43-48, 52 and 53 were rejected under 35 U.S.C. 102(b) as being anticipated by Tomisawa (US Patent 5,611,311). Independent claim 43 has been amended to recite a method of calculating mechanical top dead centre comprising deriving a thermodynamic top dead center from the maximum pressure point on a pressure curve monitored within a cylinder and then applying an offset to the thermodynamic top dead centre wherein the offset is a measure of the thermodynamic loss angle between the thermodynamic top dead centre and the mechanical top dead centre. Support for this amendment is set forth at least in page 13, lines 1-4 and page 14, lines 1-5.

It is submitted that Tomisawa does not disclose all the steps recited in amended claim 43 and does not disclose the benefit resulting from implementation of the method as recited in amended claim 43. In particular, Tomisawa does not disclose applying an offset to the thermodynamic top dead centre derived from a pressure variation function, wherein the offset is a measure of a thermodynamic loss angle between the thermodynamic top dead centre and the mechanical top dead centre. Tomisawa also does not disclose the benefit of applying the offset directly to the thermodynamic top dead center which is to allow for correction of a lag between mechanical top dead centre and thermodynamics top dead centre due to the thermodynamics of the gases within the cylinder. This lag can be either mapped during engine prototyping or modeled on a computer.

As shown in FIGS. 1 and 3, Tomisawa discloses a crank angle sensing system which provides for calculation of a corrected reference crank angle position. In particular, Tomisawa discloses a crank angle sensor 14 which monitors crankshaft revolution, a cylinder pressure

sensor 17 which monitors pressure within a cylinder and a control unit 12 which receives and processes data from these sensors. The position of crank angle sensor 14 on the crankshaft defines a reference crank angle position that is stored in the control unit 12. A thermodynamic top dead centre position is derived by the control unit 12 from pressure data supplied by the cylinder pressure sensor 17 and crankshaft revolution data supplied by the crank angle sensor 14. A crank angle phase differential equal to the difference between the stored reference crank angle position and the derived thermodynamic top dead centre is calculated by the control unit 12. The calculated crank angle phase differential is applied directly to the stored reference crank angle position to generate a corrected crank angle position. Tomisawa does not disclose applying any type offset to the derived thermodynamic top dead centre position before using this derived position to calculate the corrected crank angle position. As such, the corrected crank angle disclosed in Tomisawa does not provide for correction of the lag between mechanical top dead centre and thermodynamic top dead centre due to the thermodynamics of the gases within the cylinder. Therefore, it is submitted that claim 43 is not anticipated by Tomisawa. It is therefore requested that the rejection of claim 43, as well as claims 44-48, 52 and 53 dependent thereon, be withdrawn.

In view of the above, it is submitted that applicant's claims, as amended, patentably distinguish over the cited art of record. Accordingly, reconsideration of the claims is respectfully requested.

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Respectfully submitted,

  
Lloyd McAulay  
Reg. No. 20,423  
Attorney of Record

COWAN, LIEBOWITZ & LATMAN, P.C.  
1133 Avenue of the Americas  
New York, New York 10036  
T (212) 790-9200